

**DENSITIES OF SOLIDS AND LIQUIDS**

Name \_\_\_\_\_

Instructor \_\_\_\_\_

Lab Section \_\_\_\_\_

Date \_\_\_\_\_

**Pre-Lab Questions** (Turn in to your Instructor before the laboratory period starts.)

1. Define the following words:

a. precision

b. accuracy

2. You are given an irregularly shaped lump of a material and determine that it has a mass of 35.7868 g. When placed in a graduated cylinder that initially contains exactly 24.00 mL of water, the water level rises to 28.15 mL. What is the density of the unknown material? (Show all your calculations.)

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3. You are asked to calibrate a 25.00 mL volumetric pipet. You determine that the temperature of your distilled water is exactly 23.5 °C. You carefully determined the mass of a clean dry beaker and found that it was 56.1884 g. You pulled water up to the mark and transferred this to the beaker and found that the new mass was 87.9658 g. What is the actual volume of the pipet? (Show all your calculations.)
4. You use the pipet that you just calibrated in Question 3 to determine the density of an unknown liquid. You use a fresh clean dry beaker with an initial mass of 49.4530 g. You pull the unknown liquid up to the mark in the pipet and transfer this to the beaker. The new mass of the beaker and liquid is 79.3512 g. What is the density of the unknown liquid? (Show all your calculations.)

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**In-Lab Guidelines** (This is a **guide** to suggest a format for you to **prepare** your Laboratory Notebook so that you can efficiently collect and record the data needed for each part of this experiment. Provide a space for observations of events, etc. that might affect your data. Record your data the Laboratory Notebook. Turn in the duplicate pages of your observations to your Instructor before you leave the laboratory period.)

**A. Calibration of Pipet**

**Volume of volumetric pipet used** \_\_\_\_\_ **Temperature of water used** \_\_\_\_\_

	Trial 1	Trial 2	Trial 3
Mass of empty beaker	_____	_____	_____
Mass of beaker + 1 pipet of H <sub>2</sub> O	_____	_____	_____
Mass of water	_____	_____	_____

**Observations: (if any, spills, fingerprints, etc. that might affect your data)**

**Calibration of Graduated Cylinder**

**Volume of graduated cylinder used** \_\_\_\_\_ **Temperature of water used** \_\_\_\_\_

	Trial 1	Trial 2	Trial 3
Mass of empty beaker	_____	_____	_____
Mass of beaker + 1 vol. of H <sub>2</sub> O	_____	_____	_____
Mass of water	_____	_____	_____

**Observations:**

**Calibration of Small Beaker**

**Volume of small beaker used** \_\_\_\_\_ **Temperature of water used** \_\_\_\_\_

	Trial 1	Trial 2	Trial 3
Mass of empty beaker	_____	_____	_____
Mass of beaker + 10 mL of H <sub>2</sub> O	_____	_____	_____
Mass of water	_____	_____	_____

**Observations:**

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***B. Density of an Unknown Liquid (use same pipet as in A.)***

Identity of Unknown (Letter) \_\_\_\_\_ Temperature of liquid \_\_\_\_\_

Mass of beaker \_\_\_\_\_

Mass of beaker + 1 pipet of unknown \_\_\_\_\_

Mass of unknown \_\_\_\_\_

**Observations:*****C. Density of Regularly Shaped Object***

Identity (number or description) \_\_\_\_\_

Mass of object \_\_\_\_\_

Dimensions of object \_\_\_\_\_

Calculated volume \_\_\_\_\_

**Observations:*****D. Density of Irregularly Shaped Object***

Identity of object \_\_\_\_\_

Mass of object \_\_\_\_\_

Volume of water in graduated cylinder \_\_\_\_\_

Volume of water + object \_\_\_\_\_

Calculated volume of object \_\_\_\_\_

**Observations:**

**[You should customize your laboratory notebook so that you will be able to collect and record the data rapidly. You may wish to include a brief description of the procedure you used or how you varied the procedure. You may also wish to include a sketch of the apparatus that you used. This is the only record that you will take from the lab that you will use for the post lab report. Record anything that you observe or might be important to the report. You will learn from practice how to design your data collection pages.]**

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**Post-Lab Report** (Use the In-lab observations to complete the laboratory report. Turn in to your Instructor when you have completed the report.)

**Part A. Calibration of Volumetric Pipet and Graduated Cylinder**

*Calibration of Pipet*

**Volume of volumetric pipet used** \_\_\_\_\_

**Temperature of water used** \_\_\_\_\_

**Density of water at this temp** \_\_\_\_\_

**Trial 1**

**Trial 2**

**Trial 3**

Mass of water transferred \_\_\_\_\_

Calculated volume of water \_\_\_\_\_

**Average volume** \_\_\_\_\_

*Calibration of Graduated Cylinder*

**Volume of graduated cylinder used** \_\_\_\_\_

**Temperature of water used** \_\_\_\_\_

**Density of water at this temp** \_\_\_\_\_

**Trial 1**

**Trial 2**

**Trial 3**

Mass of water \_\_\_\_\_

Calculated volume of water \_\_\_\_\_

**Average volume** \_\_\_\_\_

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**Part. B *Density of Unknown Liquid*****Identity of Unknown** \_\_\_\_\_ **Temperature of Liquid** \_\_\_\_\_**Mass of Unknown Liquid** \_\_\_\_\_**Volume of Liquid** (see A.) \_\_\_\_\_**Calculated Density** \_\_\_\_\_**Part C. *Density of Regularly Shaped Object*****Identity of Unknown** \_\_\_\_\_**Mass of Unknown** \_\_\_\_\_**Calculated Volume of Unknown** \_\_\_\_\_**Calculated Density** \_\_\_\_\_**Part D. *Density of Irregularly Shaped Object*****Identity of Unknown** \_\_\_\_\_**Mass of Unknown** \_\_\_\_\_**Calculated Volume of Unknown**  
**(from displacement of water)** \_\_\_\_\_**Calculated Density** \_\_\_\_\_**Experimental Errors**

(Experimental error is a fact of scientific life. It is in the nature of scientific measurement that *uncertainty* is associated with every quantitative result. These may result from limitations in equipment, techniques, skill, mistakes/blunders, etc. Assess what sources of error may be present in this experiment and how they would have affected your results.)



**EXPERIMENT #2**

**DENSITIES OF SOLIDS AND LIQUIDS**

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